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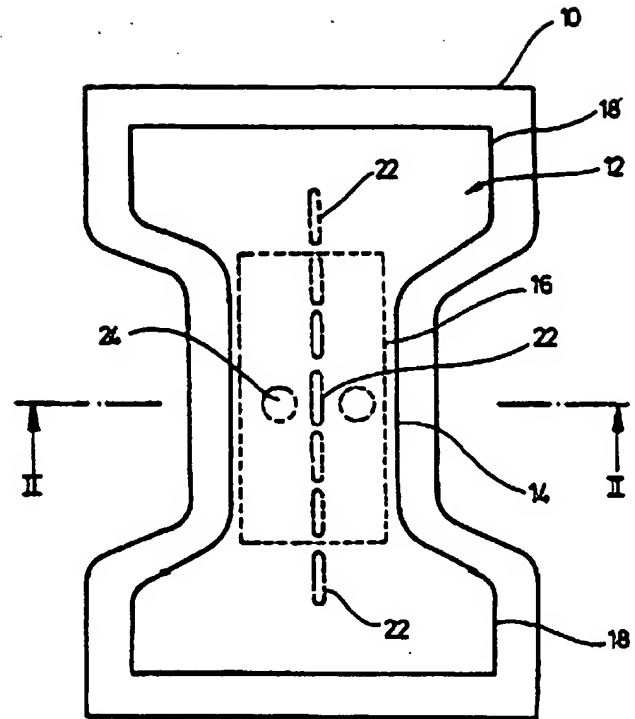
DISPOSABLE DIAPER

|                                |  |
|--------------------------------|--|
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**Abstract**

In order to indicate a leakage failure, when a disposable diaper is wet and needs to be changed, at least two humidity indicators visible from the outside when the diaper is opened are mutually spaced apart and are mutually offset at least in partial areas in the longitudinal direction of the diaper.



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## Description

The invention concerns a disposable diaper as indicated in the preamble of Claim 1.

With disposable diapers, integrating wetness indicator agents into the absorbent diaper body is already known, so as to be able to recognize whether a wetted diaper must be changed, without loosening the diaper while it is being worn.

For example, one or more indicator strips that include an indicator suitable for the indication of moisture are arranged along the lengthwise axis of the diaper.

It is a problem with these known disposable diapers, which are used in particular in the care of incontinent patients or other incontinent persons under care that, in spite of the indicator strips, one cannot flawlessly recognize if changing the diaper is only mildly necessary or, because the liquid holding capacity has already been exhausted, is immediately necessary. Flawless recognition of the condition of the diaper is not always possible, especially during nighttime care of patients or other persons under care in hospitals or nursing homes.

The invention is now based on the task of making available another disposable diaper of the kind mentioned at the start.

This task is solved in accordance with the invention by the characteristics of Claim 1 for a disposable diaper of the kind mentioned at the start.

Thus, in accordance with the invention the wetness indicators, which are visible from the outside when the diaper is worn, are arranged so that at least partial regions of these separate wetness indicators are mutually offset in the lengthwise direction of the diaper. With the advantageous embodiments of the invention as in Claims 2 to 5, indicator strips that can be arranged in different distribution patterns over the diaper are used as indicator agents. However, what is important here is that these patterns are formed from individual, separate indicator agents, so that the wetness-sensitive indicators contained in the indicator agents respond, in practical terms, only to the liquid absorbed by the adjacent regions of the absorbent diaper body.

Besides flawless indication of the regions of the absorbent body that have absorbed liquid, visual recognition is also made considerably easier, since one no longer has to guess how far the reaction of the color indicator caused by wetness has spread in the indicator agent. Rather it need only be established whether certain indicators, thus a certain indicator strip indicates a wetness reaction or not.

The embodiment as in Claim 6 is intended to enable especially good allocation of the wetness indicators relative to the liquid uptake capacity of the absorbent diaper body.

A further improvement to the visual recognition of remaining liquid uptake capacity of a disposable diaper is achieved by the further development as in Claim 7.

The color indicators corresponding in particular to Claims 8 to 10, which changed their color depending on the absence or presence of wetness, thus washable dyes, dissolved by the

liquid taken up by the absorbent diaper body from the wetness indicators, are especially suitable for the wetness indicators. Accordingly, the wetness indicators in correspondence with Claim 11 are applied to the inner side of the wetness protection film.

The invention is illustrated in more detail below by means of the figures. Here:

Figure 1 shows a plan view of a spread disposable diaper,

Figure 2 shows a cross section through the diaper essentially through line II-II in Figure 1, and

Figures 3a through 3d each show a plan view of the outer side of a disposable diaper with differently arranged wetness indicators.

In the different figures the parts that correspond to each other are provided with the same reference numbers.

The disposable diapers represented in Figures 1 and 2 have a liquid-impermeable outer protective film 10 on one side, the underside in Figure 1, which consists of polyethylene and is at least translucent. On the side of the protective film toward the body there is an absorbent diaper body 12, which is formed of a suitable liquid-absorbing material, for example a cellulose fiber blend, which preferably contains superabsorbent substances mixed in.

As is indicated by the broken lines in Figure 1, the absorbent diaper body 12 can have a reinforcement 16 in the crotch region 14 in order to be able to uptake liquid as rapidly as possible and to keep it in this region while the diaper is being worn. The waist regions 18 of the absorbent diaper body 12 accordingly have lower thickness. The body side of the absorbent diaper body 12 is covered with a cover layer 20, which is advantageously formed of a porous, liquid-permeable nonwoven material. This nonwoven cover 20 is bonded to the protective film 10 in the edge region of the diaper in the usual way.

A plurality of wetness indicators 22 is provided on the side of the protective film 10 that is turned toward the absorbent diaper body 12 as shown in enlarged form in Figure 2 and likewise indicated by broken lines in Figure 1.

These wetness indicators are, in correspondence with Figure 1, formed as relatively short indicator strips 22 and arranged along the lengthwise axis of the diaper. Spot shaped markings 24 are assigned to the middle indicator strips as marking means. The indicator strips 22 contain, for example, a wetness-sensitive color indicator, which is applied to the body side of the protective film 10 or the side of the absorbent diaper body 12 turned away from the body, by means of a carrier substance, for example a thermoplastic material, especially a hot-melt glue. The color indicator changes its color depending on its dryness or wetness, so that when a diaper is worn one can see from the outside if it is dry or wet and, if it is wet, to what extent the diaper can still hold liquid. In order to be able recognize the still-remaining liquid uptake capacity easily,

marking spots 24 are provided, which mark the reinforcing strips 22 that are centrally arranged in the crotch region 14 of the diaper.

The markings 24 in this case must be formed either of a water-insoluble dye or of a color indicator that is clearly visible when wetness is present.

This diaper has the advantage that the liquid fullness of the diaper can be seen relatively accurately, since the wetness indicator strips in the lengthwise direction of the diaper have distinct spacings, so that they can easily be recognized as individual indicators.

Figures 3a through 3d represent various arrangements of wetness indicators. Figure 3a shows a plurality of wetness indicator strips 22 arranged symmetrically and parallel to the lengthwise direction of the diaper. Here, the length of the individual indicator strips 22 decreases from the middle of the pattern toward the outside, so that the more centrally located indicator strips 22 extend from the crotch region 14 up to the waist regions, while the outermost indicator strips are provided only in the crotch region.

Figure 3b shows an arrangement of indicator strips provided transversely to the lengthwise direction of the diaper and whose length increases from the crotch region 14 up to the waist regions.

Another pattern arranged parallel to the lengthwise direction of the diaper is shown in Figure 3c, where the individual strips mark an hourglass-shaped area that is essentially symmetrical to the position of the greatest liquid accumulation in the crotch region of the diaper.

Last, Figure 3d shows another possibility of designing and arranging the wetness indicators in accordance with this invention. The wetness indicators are designed as circles in this example. However, other geometric shapes such as triangles, squares or informative patterns such as numbers or letters, can be provided. The indicator circles 26 consist of an inner region 27 and a ring-shaped outer region 28. A water-soluble dye is used for the inner region 27, while a water-insoluble dye can be used for the outer region 28 of the indicator circle 26.

In the regions in which the body fluid is held by absorbent diaper body 12, these fluids wash the water-soluble dye out from the indicator circles so that, as indicated in Figure 3d in the crotch region 14, rings are formed from the indicator circles that appear as solid points if the diaper is dry; these rings are formed in the outer region 28 of the indicator circles by the water-insoluble dye.

If such disposable diapers are used in the care of incontinent patients or other incontinent persons under care, it is easy for the nursing personnel to see, from the outside without opening the diaper, if the diaper is already so wet that it needs to be changed, thus the liquid uptake capacity has been exhausted. Here, the arrangement of the individual wetness indicators at a distance apart from each other is advantageous, since the nursing personnel can unambiguously

see in which diaper regions body fluid has already been taken up and which regions still remain for absorption of liquid.

In this way in particular, changing the diaper prematurely is also avoided, which leads to a reduction of care costs and, conversely, also avoided is a person under care lying in a wet, body-fluid-soaked diaper.

#### Claims

1. A disposable diaper
  - with a liquid-impermeable protective film (10)
  - with an absorbent diaper body (12) situated on the body side of the liquid-impermeable protective film (10) and
  - with wetness indicators (22, 26) situated between the liquid-impermeable protective film (10) and absorbent diaper body (12) assigned to the absorbent diaper body (12) and these are visible from outside without opening the diaper that is being worn, which is characterized by the fact that,
    - that at least two separate wetness indicators (22, 26) are provided, which are mutually offset at least in partial regions in the lengthwise direction of the diaper.
2. A disposable diaper as in Claim 1, which is characterized by the fact that indicator strips (22) extending essentially parallel to the lengthwise direction of the diaper are provided as wetness indicators.
3. A disposable diaper as in Claim 1, which is characterized by the fact that indicator strips (22) extending essentially transverse to the lengthwise direction of the diaper are provided as wetness indicators.
4. A disposable diaper as in Claim 2 or 3, which is characterized by the fact that the indicator strips (22) are of different lengths.
5. A disposable diaper as in Claim 2, 3 or 4, which is characterized by the fact that the indicator strips (22) are symmetrically arranged with respect to the lengthwise direction of the diaper.
6. A disposable diaper as in one of the preceding claims, which is characterized by the fact that the wetness indicators (22, 26) are symmetrically arranged with respect to the area on the absorbent diaper body (12) with the greatest liquid accumulation.
7. A disposable diaper as in one of the preceding claims, which is characterized by the fact that wetness-insensitive marking means (24, 26) are assigned to at least some of the wetness indicators (22, 26).

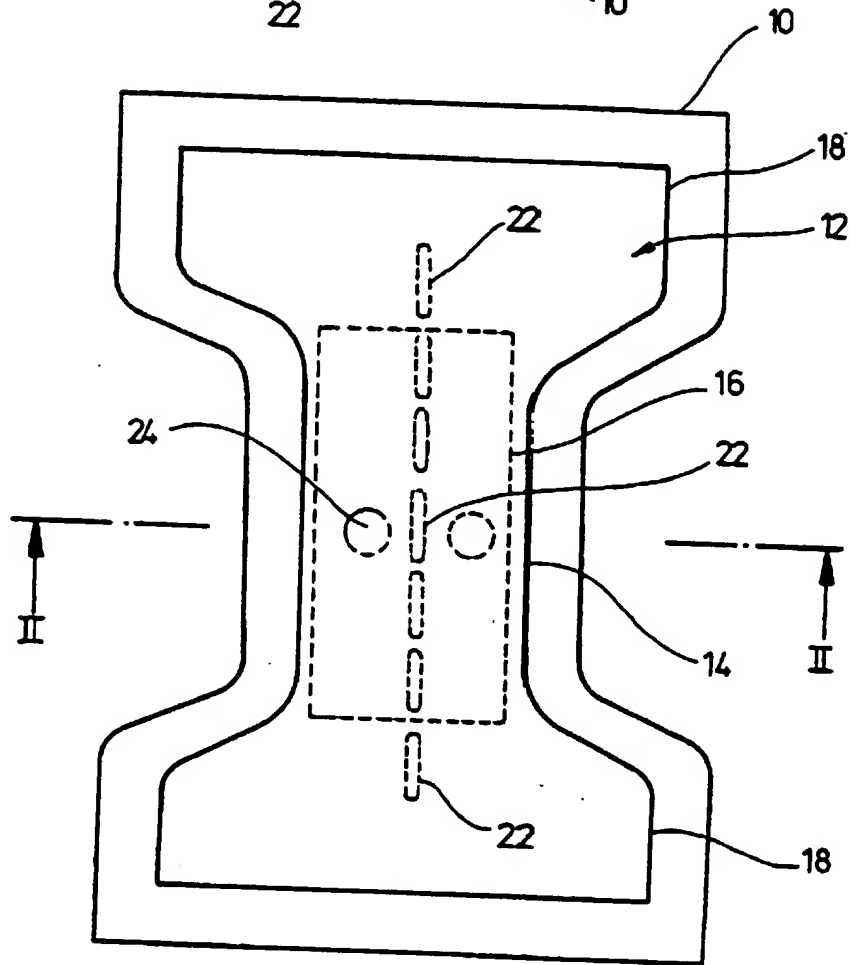
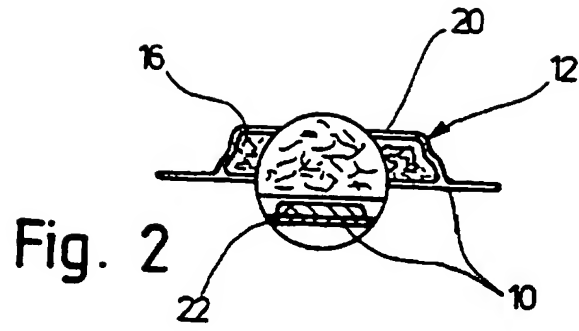


8. A disposable diaper as in one of the preceding claims, which is characterized by the fact that the wetness indicators (22, 26) include color indicators responding to moisture together with a support means.

9. A disposable diaper as in Claim 8, which is characterized by the fact that a hot-melt glue is provided for support means.

10. A disposable diaper as in one of Claims 1 to 7, which is characterized by the fact that the wetness indicators (22, 27) include water-soluble dyes.

11. A disposable diaper as in one of the preceding claims, which is characterized by the fact that the wetness indicators are applied to the liquid-impermeable protective film (10).



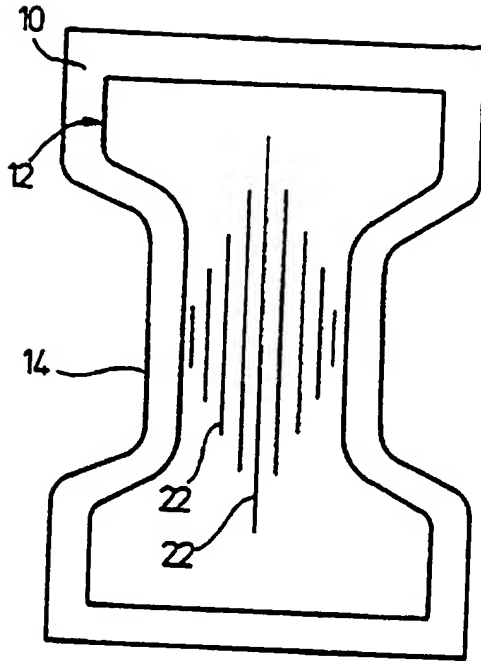


Fig. 3a

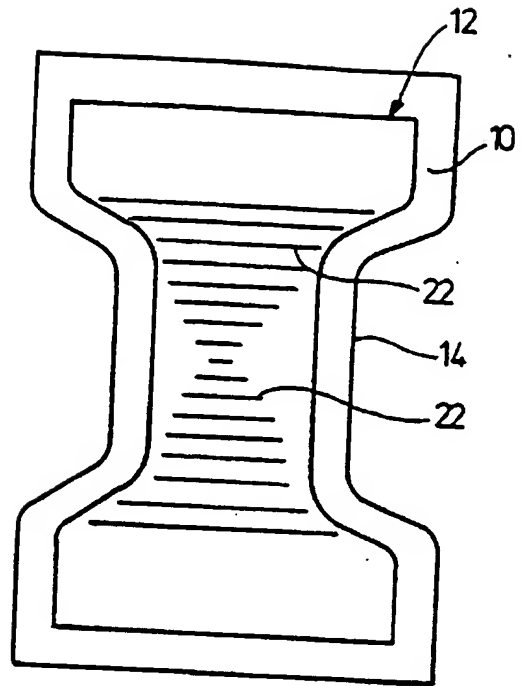


Fig. 3b

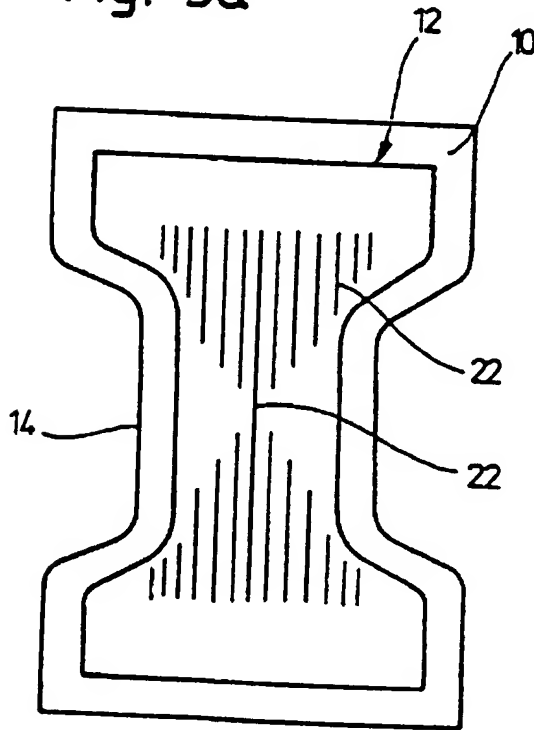


Fig. 3c

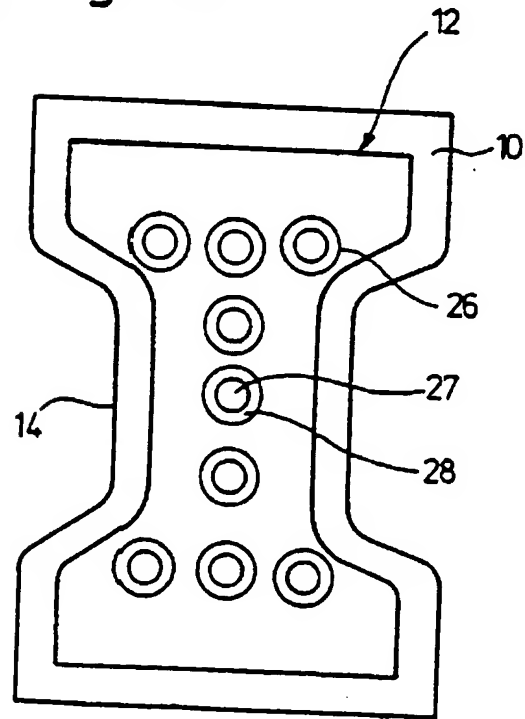


Fig. 3d

## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/EP 94/01862

 A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 5 A61F13/42

According to International Patent Classification (IPC) or to both national classification and IPC

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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|  | DE, A, 20 31 104 (H. J. SIEVERS) 30 December 1971<br>see figure 2<br>-----         | 4                     |

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Information on patent family members

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                      | Publication<br>date              |
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| US-A-4705513                              | 10-11-87            | NONE  |                                  |
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